

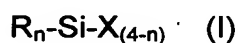
CLAIMS

1. A composite liquid crystalline mixture having a low refractive index and a chemical reactive power that makes it capable of minimizing an anchoring energy when in contact with silica, said mixture comprising:
 - (a) low ordinary refractive index nematic liquid crystal of a single type or a mixture of low ordinary refractive index nematic liquid crystals of different types;
 - (b) at least one reagent compound capable of reducing the anchoring energy via a chemical shielding process and from which originates a decoupling effect with a glass interface leading to the reduction of the anchoring energy and appropriately orienting a liquid crystal director at this interface; and
 - (c) at least one low refractive index additive having a relatively low viscosity.
2. The composite liquid crystalline mixture according to claim 1, wherein component (a) consists of a mixture of nematic liquid crystals of different types that are selected to be readily miscible with each other so as to form a chemically and thermally stable mixture and provide a widened nematic temperature range in comparison to liquid crystals of single type.
3. The composite liquid crystalline mixture according to claim 2, wherein the mixture of nematic liquid crystals has a positive or negative dielectric anisotropy.
4. The composite liquid crystalline mixture according to claim 3, wherein the mixture of nematic liquid crystals has a nematic range near to the temperature interval range of -10°C to 70°C.

5. The composite liquid crystalline mixture according to claim 1, wherein the nematic liquid crystals used as component (a) are selected from the group consisting of cyclohexyl carboxylic acid, bicyclohexyl, phenyl cyclohexyl, biphenyl, biphenyl cyclohexyl, terphenyl, ester, phenyl cyclohexyl carboxylate, bicyclohexyl ester cyclohexyl, diester, Schiff, cyclohexyl cyclohexanoate, biphenyl ester, biphenyl cyclohexylcarboxylate, thioester, CCN and BCN.

10 6. The composite liquid crystalline mixture according to claim 1, wherein the at least one reagent compound, used as component (b) is selected from the group consisting of organic silanes, siloxane copolymers, polysiloxane polymers and mixtures thereof, said reagent compound being readily miscible in the liquid crystalline mixture.

7. The composite liquid crystalline mixture according to claim 6, wherein said at least one reagent compound (b) is an organic silane of formula I:



20 wherein R is an organic non-functional group that cannot react with said component (a), X is a functional group selected from group comprising -OH, -OCO-, -OCONH₂, -OCONH-, -OCON-, -CN, -SCN, -OR, -OCONHR, -COOR, -CH=CH-, an epoxy group, and -OSi(CH₃)₂OSiH(CH₃)₂, said functional group being capable of reacting with an organic or inorganic material so as to form an optical waveguide surface by means of hydrogen bonds and/or covalent bonds, and n = 0,1,2,3.

8. The composite liquid crystalline mixture according to claim 7, wherein the organic non-functional group is an alkyl.

9. The composite liquid crystalline mixture according to claim 6, wherein the at least one reagent compound (b) is a diphenyl dimethyl siloxane copolymer.
10. The composite liquid crystalline mixture according to claim 6, wherein the at least one reagent compound (b) is a polysiloxane polyether.
- 10 11. The composite liquid crystalline mixture according to claim 1, wherein the at least one reagent compound (b) further comprises a Si-O-Si bond so as to maximize its reactivity with a silanol group (SiOH) of the silica.
12. The composite liquid crystalline mixture according to claim 1, wherein the at least one reagent compound (b) is present in a ratio from 0.1 to 10% by weight of said composite liquid crystalline mixture.
- 20 13. The composite liquid crystalline mixture according to claim 1, wherein the at least one additive used as component (c) is selected to be readily miscible in said liquid crystalline mixture and capable of modifying dielectric anisotropy, conductivity, viscosity and mesogenic phase or orientation of a director field.
14. The composite liquid crystalline mixture according to claim 13, characterized in that the at least one additive (c) is a dichroic dye.
- 30 15. The composite liquid crystalline mixture according to claim 13, wherein the at least one additive (c) has a refractive index that is lower than the ordinary refractive index of the liquid crystalline mixture so as to decrease and adjust the ordinary refractive index value below the refractive index of a waveguide cladding.

16. The composite liquid crystalline mixture according to claim 1, wherein said mixture has a birefringence value that is comparable or greater than the difference between core and cladding refractive index of an optical wave guide.
17. The composite liquid crystalline mixture according to claim 16, wherein said mixture has an ordinary refractive index that is lower than the refractive index of the silica.